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Forest Research Notes

N**ortheastern Forest**

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NATURAL REGENERATION IN BOTTOMLAND HARDWOODS OF SOUTHERN NEW JERSEY

What kind of natural regeneration follows cutting in the bottomland hardwoods of southern New Jersey?

Some practicing foresters in this section have observed that dense shrubby understories are usually quick to develop after cutting and that these understories suppress desirable tree reproduction. For example, Smith¹ noticed that imperfectly and poorly drained loams usually supported luxuriant understories of shrubs and herbs, and cutting often so stimulated these understories that they limited the growth of desirable tree reproduction. In some areas he noticed no desirable reproduction even 10 years after cutting. This is quite different from experience in the South, where shrub-vine understories on bottomland sites do not seriously hinder stand regeneration.²

This note describes changes over a 12-year period in reproduction in two cut-over bottomland stands of southern New Jersey.

Study Areas

Both of the stands studied are on relatively level, poorly drained soils of the Fallsington series. In 1945 these stands were 75 to 80 years old. In Stand A, red oaks (chiefly pin oaks) and sweetgum accounted for 78 percent of the stems larger than 2.6 inches d.b.h. In Stand B, the red oaks, white oaks, and sweetgum comprised 64 percent of the stems; red maple accounted for another 26 percent.

In the winter of 1945-46, both stands received a light

¹Smith, G.F. Observations on managing hardwoods in the Delaware Valley of southern New Jersey. Jour. Forestry 51: 189-191. 1953.

²Putnam, J.A. Management of bottomland hardwoods. U.S. Forest Serv. South. Forest Expt. Sta. Occas. Paper 116. 60 pp. 1951.

Table 1.--¹Dominance of desirable and undesirable vegetation
in the understory, 1946 and 1958

Kind of vegetation	Stand A quadrats dominated in:		Stand B quadrats dominated in:	
	1946	1958	1946	1958
	Percent	Percent	Percent	Percent
<u>Desirable trees:</u>				
Sweetgum	--	35	30	33
Yellow-poplar	--	--	5	10
Ash ²	--	--	3	3
Oaks ²	--	2	--	9
Total	0	37	38	55
<u>Undesirable vegetation:</u>				
Trees ³	5	16	18	20
Shrubs ⁴	53	32	22	20
Herbs	42	15	22	5
Total	100	63	62	45

¹Dominance: the tallest plant on the quadrat.

²Includes black, southern red, pin, willow, white, and swamp white oaks.

³Includes red maple, blackgum, sweetbay, aspen, sassafras, hophornbeam, black cherry, and gray birch.

⁴Chiefly southern arrowwood, sweet pepperbush, elderberry, spicebush, and deciduous holly.

cut, the first cut of a 2- or 3-cut shelterwood system used in managing such stands in this section.³ Sixteen red oaks containing 5,193 board-feet (Doyle Rule) were removed from a 1-acre plot in Stand A. From a similar plot in Stand B, 14 red oaks with a volume of 4,481 board-feet (Doyle Rule) were cut. The cutting left 94 trees, mostly larger than 11 inches d.b.h., in the Stand A plot; and 114 trees, mostly larger than 12 inches d.b.h., in the Stand B plot. Oaks and sweetgum together formed 77 percent of the stems left in the Stand A plot, 60 percent in Stand B.

In Stand A, a second cut was made in 1953, largely because waste water from a nearby mill was damaging overstory trees. A considerable portion of Stand B was blown down by a 1954 hurricane, so a salvage cut was made there in 1955. These cuttings left few overstory trees in either 1-acre plot.

Although neither plot contains seed-producing sweetgums or red maples, both receive abundant seed of these species from adjacent areas. In 1958, no source of acorns remained on the plot in Stand A, but the Stand B plot had several residual oaks of seed-bearing size.

³Moore, E. B., and Lentz, A. N. The cooperative forest management program in New Jersey. Jour. Forestry 49: 31-34. 1951.

Study Methods

On the 1-acre plot in each area, 60 milacre-quadrats were established, 30 along each of two permanently marked lines. Tree reproduction, shrubs, and herbs were tallied on each of the quadrats in the summer of 1946 after the initial cut. The last tally was made during the summer of 1958.

Results and Discussion

Although the understories of the two stands differed in 1946, they have undergone similar changes since then (table 1). Now, undesirable vegetation dominates much less of the understory than it did in 1946. Herbs decreased the most; shrubs also declined; while among the undesirable vegetation--which lessened as a whole--trees assumed more importance.

The gain in desirable tree reproduction was greatest in Stand A, and was practically all due to the assumption of dominance by sweetgum (table 1). But in 1946 no desirable reproduction was dominant on any quadrat in that stand. In contrast, Stand B then had 38 percent of its quadrats dominated by desirable tree species. On this plot yellow-poplar and oaks accounted for most of the 17-percent gain during the following 12 years.

Although oaks formed a major part of the harvested stands, they are less important in the reproduction. In 1958, sweetgum dominated the most quadrats in both stands, while oaks dominated less than 10 percent of the quadrats. In Stand A, oak reproduction was found on only 15 percent of the quadrats, indicating that it may form little of the next

Table 2.--Occurrence of desirable reproduction, 1946 and 1958

Stand	Species	On all quadrats		On quadrats dominated by undesirable vegetation	
		1946	1958	1946	1958
A		Percent	Percent	Percent	Percent
	Sweetgum	52	47	52	21
	Yellow-poplar	7	--	7	--
	Oaks ¹	7	15	7	13
	Desirable	55	55	55	29
B					
	Sweetgum	77	72	70	67
	Yellow-poplar	37	18	35	11
	Ash	12	7	5	--
	Oaks ¹	32	43	30	41
	Desirable	88	92	81	82

¹Includes black, southern red, pin, willow, white, and swamp white oaks.

crop. However, oaks did occur on 43 percent of the Stand B quadrats (table 2) where many may become a part of the next overstory.

If uniformly spaced, the desirable stems now dominant (370 per acre in Stand A, 550 per acre in Stand B) would provide desirable future stands. Unfortunately, the spacing is not uniform; in certain cases the distance between quadrats containing dominant desirable stems is over 50 feet. Still, the present spacing should improve because: (1) only 3 or 5 years have elapsed since the final cut; (2) desirable subdominants now occur on 29 or 82 percent of the quadrats dominated by undesired vegetation; and (3) sweetgum seed is still falling in both plots.

In view of these facts, and because hardwood crop trees number only about 100 per acre in mature stands, the reproduction of both areas offers promise of forming satisfactory stands. However, results here seem better than in many New Jersey bottomland stands where longer intervals between cuts, or repeated light cuts, have favored dense shrubby understories.

Conclusions

Results of this study indicate that natural reproduction will provide desirable stands in bottomland hardwoods harvested by proper use of the shelterwood system.

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